clusions drawn from the data must be made with caution. Ten of the seventeen plants had interstitial chiasmata, and the remaining seven were terminal. The plants have been arranged in the order of their fertility; and coincidence will probably not explain why the most fertile all had localized chiasmata. The third column depicts the situation as to chromosome pairing at IM. The cells examined in each plant exceed fifty. The two most fertile plants were devoid of irregularities, but so was one of the most sterile. Another interesting matter is the complete lack of correlation between per cent. of good pollen and fertility. The most fertile plant has 67 per cent. good pollen, and the next to the most sterile had 99.3 per cent. There are fertile plants with a high per cent. of good pollen, and others with a low per cent. This is equally true of the more sterile plants.

The temptation is strong to state that type of chiasmata in each species is gene controlled. If this is true, the ten plants showing interstitial chiasmata should all be homozygous recessives, and all their progeny should have bivalents with interstitial chiasmata. The seven plants with terminal chiasmata should all be heterozygous, and their progeny should segregate for terminal and interstitial. Populations from each of the seventeen plants are now in the seedling stage, and next spring a large number of each will be examined.

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HOW LONG DO ROOTS OF GRASSES LIVE?

ROOTS have been investigated much less than the above-ground parts of the plant because their study necessitates much more difficult technique due to their inaccessibility. As a result the length of life of both seminal and nodal roots remains a disputed question. Many earlier botanists suggested that the seminal root served to supply the plant only for a few weeks prior to the growth of nodal roots. Later workers showed that the seminal root served throughout life in annual grain plants. No work is known to the writer which concerns the length of life for either type of root in perennial grasses.

In 1932 Dr. J. E. Weaver, of the University of Nebraska, suggested to the writer the possibility of placing permanent marked bands on roots as a means of identification for determining life span. This was tried on a group of typical prairie grasses grown from both seed and rhizomes.

Containers one foot in diameter and three feet in depth were fitted with a removable metal collar extending about 4 inches above the top. The soil, therefore, extended well above the top of the container and, by removing the collar, the upper part of the roots could easily be exposed by gently washing or picking the loose sandy soil away. A small aluminum band about one fourth inch wide was stamped with a number and bent around each individual root about two inches below the soil surface. The plants were examined every six months for two years. They were subjected to all degrees of soil moisture from below the wilting coefficient to saturation, and to temperatures of 0° F. to 112° F. The results are shown in Table I.

TABLE I

Species	No. banded	Number of banded roots living			
		6 mo.	12 mo.	18 mo.	24 mo.
Sporobolus heterolepis	5	5	5	4	2
Panicum virgatum	3	3	3	3	3
Bouteloua curtipendula	8	8	8	8	2
Andropogon furcatus	10	10	10	10	6
Stipa spartea	5	5	5	3	0

These results show that in all plants studied a root lives for at least a year and many in excess of two years. Some new roots are produced each season.

Tests made on the seminal roots of *Andropogon furcatus* revealed that all lived to an age of 18 months and some were still functioning at the end of two years. Thus the life span of the seminal root appears to approach, at least, that of the nodal root.

From these preliminary tests it is concluded that the method outlined is very satisfactory for measuring the life span of roots. These tests indicate that both seminal and nodal roots of prairie grasses, even under adverse conditions, may live in excess of two years.

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BOOKS RECEIVED

BOND, PERRY A. *The Fundamentals of General Chemistry.* Pp. x + 411. 68 figures. Farrar and Rinehart. $3.00.

COMMITTEE ON METHODS OF ANALYSIS, C. E. MANGELS, Chairman. *Cereal Laboratory Methods.* Third edition, revised. Pp. viii + 205. 9 figures. American Association of Cereal Chemists, Omaha.

GRUENBERG, BENJAMIN C. *Science and the Public Mind.* Pp. xiii + 196. McGraw-Hill. $2.00.

STEPHENSON, T. A. *The British Sea Anemones.* Vol. II. Pp. 426 + 16. 33 plates. 10 figures. Ray Society, British Museum, London. 37/6.

WETTSTEIN, OTTO. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien.* LXXXIV. Band. Heft. 1–4. Pp. 86 + 48. 5 figures. Zoologisch-Botanischen Gesellschaft, Wien.